IBCC call Colorado River Basin

1. November 26, 2018, CBRT Minutes.

1. **November 26, 2018 CBRT Minutes –** Hydrologic forecast for 2019 water year ending 9/30/19; Colorado River District response to CWCB policies on demand management and Colorado River Compact call; cloud seeding efforts in Colorado.

2. **Next Meeting: Jan. 28, 2019, Glenwood Springs Community Center, 12:00 – 4:00.**

3. **Upcoming Meetings**
   a. Tues. Jan. 22, 2019, CBRT Roundtable Next Steps Meeting.
   b. Mon, January 28, CBRT Roundtable Meeting.
   c. Feb 20-22 snow school in Silverton, a 2 ½ day professional development workshop, Center for Snow and Avalanche Studies, Silverton.

4. Reporter: These minutes were prepared by Ken Ransford, Esq., CPA, 970-927-1200, ken@kenransford.com.

5. **CBRT Members Present**: Steve Aquafresca, Art Bowles, Paul Bruchez, Stan Cazier, Carlyle Currier, Angie Fowler, Russ George CWCB, Dan Harrison West Divide Water Conservancy District, Mark Hermundstad, Bruce Hutchins, Diane Johnson, April Long, Ed Moyer, Ken Neubecker, Chuck Ogilby, Jim Pokrandt, Ken Ransford, Lane Wyatt

6. **Guests:** Ken Baker Arkansas Basin Roundtable, Jeff Bandy Denver Water, John Currier Colorado River District (Colorado River District), Quinn Donnelly River Restoration, Bill Fales Cold Mountain Ranch, Brent Gardner Smith, David Graf CPW, Megan Holcomb CWCB, Greg Johnson CWCB, Brett Jolley Bookcliff CD, Zane Kessler Colorado River District, Lisa McDonald Pitkin County, Dave Merritt Colorado River District Board, Maria Pastore Colorado Springs Utilities, Greg Poschman Pitkin County, Laurie Rink Mid Colo WCD, Russ Sands CWCB, Richard Vangytenbeek Colo Trout Unlimited, Kent Whitmer Middle Park WCD

7. **River Forecast.** The Colorado River is flowing 700 cfs at Dotsero, lower than the median flow of 940 cfs on this date. The Colorado River is flowing 1,400 cfs at Cameo, lower than the median flow of 1,700 cfs on this date.

8. **Six themes in Colorado River basin roundtable's basin implementation plan:**

   a. Ecosystem health – protect and restore streams and riparian areas.
   b. Agriculture – sustain, protect and promote agriculture.
   c. Safe drinking water – secure and protect safe drinking water.
   d. Conservation – ensure a high level of basin-wide conservation.
   e. Land use – develop local water conscious land use strategies.
   f. Basin administration – assure dependable basin administration of Shoshone and Cameo calls to keep water in the Colorado mainstem.

9. **WSRA grant fund**. There is $137,416 remaining in the CBRT WSRA Fund. Karn **Stieglemeier recommended approval of $5,000 for the NWCOG QQ Committee to develop best practices for municipal conservation for West slope municipalities**. It was seconded by Diane Johnson, and **passed unanimously**.

10. **Water Supply Reserve Account (WSRA) Grants**. We have $132,415, after allocating $5,000 to NWCOG. Pending grant requests are $45,000 to modify the drop structure on the Roaring Fork River to enhance river passage while still supplying the Robinson Ditch, and $10,000 for riparian improvements to Las Colonias Park. We should get a $40,000 replenishment grant in January 2019, and another similar replenishment in April. There will be full funding of $10 mil for the Water Supply Reserve Fund and $10 million for Colorado Water Plan grants, so next July 1 the CBRT should receive $400,000 (4% of the total $10m WSRF grant). Legislative funding is allocated 64% to the state CWCB WSRA account, and 36% to the roundtables, with 4% for each roundtable.

11. **Las Colonias river rehabilitation grant request**. The purpose of Las Colonias grant request is to **rehabilitate the river bank** and to eliminate invasive species including tamarisk and Russian olives. The Next Steps Committee recommends approval for **$10,000**. Mark Hermundstad motioned to approve, Diane Johnson seconded it, and it **passed unanimously**.

12. **Hydrology (precipitation) update, Jeff Derry**, director of the Center for Snow and Avalanche Studies, Silverton, reports that 2018 was the third worst inflow into Lake Powell since it started filling in 1964; 2002 is the worst, followed by 1977. The most likely inflow into Lake Powell for 2018 is 7.5 maf. Lake Powell's elevation is now 3,585.' For Water Year 2019 (ending October 31, 2019), the best guess is that **Colorado is going into a weak-moderate El Nino; at least it isn't another La Nina year**. It will be cooler and wetter in Southern Colorado. El Nino makes for a low amplitude, zonal jet stream, which means active weather. The 2017-18 La Nina year presented a high amplitude jet stream that formed a blocking pattern, pushing the jet-stream and storm tracks north. The developing El Nino is a pattern change, and Jeff hopes it will be more like 2017, where 13-14 atmospheric rivers came through Colorado and provided more moisture. The storm in the last few days helped—southwest Colorado now has 82% normal SWE (snow-water equivalent), up from 72% on November 20, 2018. We are close to median SWE levels for stations that are important for Lake Powell.

    a. **The current 3-month outlook looks like a typical El Nino pattern**.

    b. **Temperature is warmer than prior El Nino events, with increasing temperatures expected.**

    c. Feb 20-22 snow school in Silverton, a 2 ½ day professional development workshop. Jim Pokrandt took it formerly, and learned a lot about snow science, and it's a beautiful location.

    d. Will LIDAR be used to collect snow depth data? LIDAR, which stands for **Light Detection and Ranging**, is a remote sensing method that uses light in the form of

a pulsed laser to measure ranges (variable distances) to the Earth. **It provides very accurate SWE data, but is also expensive**. Using LIDAR to measure snow depth was first developed in the Silverton Basin, so they continue to fly over it every year to add to the database. **This is the likely SWE evaluation technology for the future**—airborne data will augment land measurements.

e. The **ultimate goal is to design instruments for a satellite**, to see what works best on terrain with forests or open snow cover, and in different regions such as California or Colorado. The goal is to measure SWE, not snow depth.

f. In 2010, we had a record runoff past Glenwood Springs; there was more snow above the SNOTEL sites that was not predicted by the SNOTEL sites, so the runoff was larger than forecast. In other years, SNOTEL indicated high snowpack, but the runoff was low. **There aren't enough SNOTEL stations in higher elevations;** the highest is 11,000,' while locations in Silverton are at 12,500.'

13. **West slope river district policies for drought management**. The roundtable listened in on a joint **meeting between Colorado River District and Southwest River District boards** of directors, held to decide whether to approve the CWCB policies on voluntary diversion cutbacks (demand management) and how to respond to a Colorado River Compact call. Colorado River District GM Andy Mueller led the discussion.

a. The **Upper Colorado River Commission is developing a policy** that is not governed by either Section 602(a) of the 1968 Act (when Congress approved the Central Arizona Project), or the 2007 Interim Guidelines. This policy must first be **approved by the 4 Upper Basin states**, and that has basically now occurred. It must also be approved by the federal government by act of Congress, but that has not occurred.

b. The Colorado River District submitted 6 principles to the CWCB in September 2018 regarding how demand management should be implemented; and the CWCB initially failed to accept 4 of them. The **tension is whether strict prior appropriation should govern a Compact call** (thus protecting West slope agricultural diversion rights that are older than the 1922 Compact), **or some other "equitable" mechanism** will be developed. Mueller reported that the CWCB released a policy statement on November 15 that contains the essence of what the Colorado River District is requesting.

c. It **defines demand management as temporary, voluntary, and compensated**, and will be implemented only as required to comply with the Colorado River Compact. It **will not be subject to the equalization release tier rules set forth in the 2007 Interim Guidelines**, and it will be consistent with state law—in particular, this means that it will **not result in injury to other water rights holders**. The most equivocal policy was #6, reproduced below; the Colorado River District recommended a policy that there would be no negative environmental impact to any sub-basin in the state, and suggested that any water

contributed to a demand management account be proportionate to the East and West slope, 50:50, and also proportionate to post-1922 Compact depletions. The CWCB used the word "equitable," and did not state it would be proportional to post-compact depletions. The fact the **CWCB** passed the policy unanimously was impressive**. Policy #6** states:

> Prioritize avoidance of disproportionate negative economic or environmental impacts to any single subbasin or region within Colorado while protecting the legal rights of water rights holders. The Board will work with water rights holders and stakeholders to assess the feasibility of and promote mechanisms for **obtaining roughly proportionate contributions of water consumptively used** from the Colorado River System to a Demand Management program over a given timeframe from participants **on each side of the Continental Divide.**

d. The second policy statement dealt with what the state would do if it could not stave off a Compact call. **The Colorado River District hopes to see a very public process where the CWCB and DNR engage in rule-making about how to deal with a Compact call**. Prior appropriation can mean different things to different sub-basins—since water right priorities are specific to each river basin, they can conflict between basins. Water engineers can come up with multiple ways to implement a curtailment consistent under the prior appropriation doctrine, with significantly different impacts. They want a system where all water users can participate.

e. If you establish a pool by **demand management, which relies on voluntary participation by ranchers, can you create a similar pool by calling out users, which is mandatory**? The Colorado River District has reserved the right to challenge the latter policy. Mueller recommended that the Colorado River District board adopt a motion supporting the 11-15-18 CWCB policy statements for demand management and Compact compliance, but not support the other elements of the CWCB's 11-15-18 statement.

f. The Colorado River District board's **policy has been to wait to see legislative language before approving or opposing it**, and the federal legislation to approve the Upper Colorado River Commission demand management policy has not yet been released. Mueller recommends that the Colorado River District board should support any federal legislation if it adopts verbatim the Upper Colorado River Commission demand management policy statements. **Glenn Porzak, attorney for the Eagle River Water and Sanitation District,** recommended that the Colorado River District board **not support paragraph 6** of the demand management policy statement (reproduced above), since it was an apparent **attempt to protect transmountain diverters**; Mueller does not agree that it is there only to protect transmountain diverters, it was added at the Colorado River District's request.

g. The Drought Contingency Plan approach has been so hurried that it hasn't allowed all water users the time to digest and have input into these policies.

h. The Colorado River District is concerned that **preserving 500,000 acre-feet could have a much different and lasting impact that preserving 50,000 acre-feet**. That is why they are concerned about how prior appropriation is administered.

i. **The Colorado River District initially pushed for** full-consensus by the West slope before the CWCB approved any non-voluntary water curtailment, amounting to **a "West slope veto" over how Colorado would address a Compact call**. The **CWCB said it would never agree** to this. Peter Fleming thinks that Phase 3 of the Colorado River Risk Study will provide much of the information the Colorado River District board needs to know before approving a demand management plan.

j. Principle 4 states that a voluntary program should not prop up another transmountain diverter, since it specifically refers to the Conceptual Framework in **Chapter 8 of Colorado's Water Plan** which provides that **any new transmountain diversion must assume the risk that water will not be available during droughts**. The Conceptual Framework, if honored, would prevent the West slope from cutting back agricultural water consumption in order to supply a transmountain diversion built after 2015.

k. The Colorado River District fears that economic forces would cause the West slope to cover a Compact call even if the program were voluntary, given the disparity in power between the West and East slope. **The Moffatt Tunnel, Granby, Fryingpan, and Roaring Fork diversions, which supply water from Fort Collins to Pueblo, all have priorities dates after 1922**. **However**, the Colorado Constitution provides that **domestic water rights have priority** over agricultural water rights, so prior appropriation law is not the whole story.

l. **Glenn Porzak** spoke on behalf of **the Eagle River WSD** and Upper Eagle Water Authority, which together deliver water to 65,000 residents. Another client, the Crystal River Ranch which holds land in Garfield and Pitkin Counties, owned by Sue Anschutz Rogers, also supports the ERWSD position. Porzak claims the only way to honor prior appropriation is to administer the river under the priority system. **The CWCB policy statements are an effort to protect the junior water rights of the Front Range transmountain diverters**. The CWCB's responsibility is to administer the law under the priority system. Porzak recommends that the **Colorado River District should not adopt the CWCB policy statements if they do not strictly follow prior appropriation.**

m. Mueller responded that it basically does, but says that equitable exceptions can be made so that administration is equitable.

n. **Marti Whitmore**, who is the Montrose County Attorney and represents Ouray County on the Colorado River District, said that while the Colorado River District has not received all that it has asked for from the CWCB it has made huge progress since mid-September when the CWCB said it would not take input from the Colorado River District. She made a **motion** "that (a) the intent of the CWCB staff and Board that **the "roughly proportionate contributions of water" referenced in paragraph 6** of the CWCB Demand Management Policy Statement **is intended to result in geographically equitable contributions of water from West Slope and transmountain water users**, and (b) that the River District will continue to advocate on behalf of West Slope water uses in future discussions concerning a demand management program." The **motion passed unanimously**.

o. Dave Merritt said curtailment is mandatory, while reduction in consumptive use is voluntary. **Merritt moved**, seconded by Director Aquafresca, that during any public process contemplated by the Compact Administration Policy Statement, the **River District will advocate for a result that is consistent with the River District's policy statement on prior appropriation**, adopted July 17, 2018, reproduced below.

> The 1922 Colorado River Compact and the 1948 Upper Colorado River Basin Compact provide that under certain circumstances, Colorado may be required to curtail water uses within the Colorado River basin to comply with interstate compact administration. The strict application of the prior appropriation doctrine in the event of compact administration could result in extreme hardship and economic disruption throughout the state. **Merely the potential for future curtailment may result in undesirable speculation** and competition for firm water supplies as Colorado moves closer to its full compact entitlement. **Therefore, limited and targeted future adaptation of the prior appropriation doctrine may be necessary** in order **to equitably allocate the state's remaining Colorado River entitlement** and to equitably address the curtailment of water uses that may be necessary to comply with the 1922 and 1948 compacts.

p. Tom Gray from the Yampa River basin agreed with Porzak's concerns that Compact administration could lend itself to mischief, and opposed Merritt's motion. Gray asked Glen Porzak for some recommended language. **Porzak recommended that they delay voting on Compact administration until specific language is crafted saying that Compact administration would be administered according to the priority system. Peter Fleming said that the CWCB won't agree** to that, and Phase 3 of the Risk Study will provide information necessary to see the effect that administration would be done. No one knows how to administer priorities between the 4 basins.

q. Bill Trampe says that all the 6 issues in the Colorado River District policy statement (which the CWCB did not accept verbatim) be adhered to.

r. **Federal legislation**. Colorado River District Director Whitmore moved, seconded by Director Hazard, to adopt a motion that federal legislation **be limited to directing the Secretary of the Interior to carry out the five interstate Drought Contingency Plan agreements** adopted by the Upper Basin states and made public by the CWCB on October 8, subject to the River District's approval of final proposed legislative language. The Motion carried unanimously.

14. **Russ George presented the CWCB board perspective**.

a. What the Colorado River District and CWCB are wrestling with, has to be seen in a particular context. This subject draws fire from every direction. About 75% of the conversation is unrelated to the subject at hand**. The whole context is the 2 compacts on the river** (the 1922 Colorado River Compact and the 1949 Upper Colorado River Compact), and who makes the decisions there has a lot to do with this. **The CWCB and the CRD and SWCD have no legal authority to tell the Compact states what to do**. Those decisions are made based on the legal documents creating the Colorado River Compact.

b. Each state has a commissioner. How do we give our Colorado representative advice so we can have some influence on what decisions are made at the Compact level**. The CWCB can't make law. This is a policy statement**. The CWCB made a policy statement because the ongoing drought has finally caught the Compact commissioners' attention. Colorado has one commissioner selected by the Governor, and the Governor alone advises that person.

c. The Colorado attorney general advises the CWCB. The CWCB had no access to the 5 policy statements from the Upper Basin states including Arizona until just recently. It wasn't clear what the CWCB should do. **The old rivalries between the West and East slope came right out of the ground, immediately**.

d. The CWCB policy statement is what it thinks is in the best interest of Colorado. **The CWCB thinks the federal government should approve the Upper Colorado River Commission demand management policy. That is all that is at play here**, instead of doing nothing and waiting for the ultimate fight between the West and East slopes. All the horses are behind the wagon, pulling against it.

e. This is all about the fear of Compact administration; **Russ George said he remembers having this conversation with the State Engineer in 2002**. There was no one then who could answer the question because it had never been done. **The State Engineer said it had to do rulemaking before it could answer the question, and it had to have a Compact call before it could do rulemaking**.

f. If you had to quantify all the water rights in the Colorado River, could you do it? We do it on a local basis, and it works, but to bunch it all together and push water down the river on demand is unknown. The CDSS systems are designed to produce this data.

g. **Voluntary, yes, temporary yes, but how about compensated**? Whose money, when, how do you sort this out. The CWCB is asking, "Are we as a state strong together on these points?" Yes, it's weak, but all compromises are. **The CWCB thinks it got it as well as it could get it. This is the context**.

h. Carlyle Currier asked, "I hope we can find ways to alleviate the need for a Compact Call through demand management, but we keep having Compact administration added into the mix. **If we have a Compact call, how much will planning for it matter, if a court orders a call?**" Russ George responded, "The problem is timing, it's so dry last year, and it will likely be dry again this year. It's a long haul to get out of this problem. We may have some time now, and let's use it, because once it's too late, what we have to say doesn't really matter. What we want is maximum assurance of minimum harm. **We want decisions now so when a call is made it is administered with harm that could have been prevented**. We should have a compromise solution first."

i. **The Lower Basin Drought Contingency Plan is** based on Lake Mead levels, it's **quantitative. The Upper Basin** plan is a drought management plan—after eliminating tamarisk and promoting cloud seeding, **there is no plan**.

j. Ken Ransford asked, "It appears **the problem is between the Yampa-White basin, which hopes to develop more water supplies, and the Gunnison Basin, which does not want any further West slope diversions on top of what is now being diverted**. Does the resolution to this all depend on the Colorado River Risk study and State Engineer rulemaking?" Russ George agreed. "We've never had to administer a call between 2 basins, so we need to figure out how to do that, and we need to take public comment to answer this question. But, ultimately, **rulemaking is how we will resolve the issue about how to address a Compact call**."

k. Other than the state's approval of a compensation plan, where does the funding come from**. Is there Lower Basin money to fund a voluntary, temporary, compensated program?** We often look to the federal government; it would be an appropriate expenditure of CRSP money. The tens of millions being spent now by the CWCB are a start. That's the easy money because it's not a new tax. What happens in a crisis? **If we have a crisis that causes a Compact call, we're all in crisis.** When you get there, what is the role of the federal government. We'd like to be able to choose that role, but in a crisis, that doesn't happen?

a. **Ken Baker**, attending as a representative for the Arkansas Basin Roundtable, commented to Ken Ransford during a break that he **believes Glenn Porzak is right**. In his letter to the Colorado River District board, Porzak said that the CWCB's "stated basis for pursuing the proposed voluntary, temporary, and compensated demand management program is that if the State does not act, the Federal government will step in and take over control of the administration of the State's water in order to avoid a Compact call. Such an action by the Federal government would be without any legal basis. **Simply put, the Federal**

government has no legal authority to administer state water rights. *California v. U.S.,* 438 U.S. 645,662 (1978) ("[e]xcept where the reserved rights or navigation servitude of the United States are invoked, *the State has total authority over its internal waters.")* (emphasis added).

2. Jim Pokrandt, Colorado River Risk Study Phase 3 update. Phase 3 is asking, "**What water rights will be affected if there is a curtailment, going back to 1922**?" Also, what about future development, or maintaining water levels called for by PBOs or Section 7 consultations? **Future development includes Moffatt and Windy Gap expansions, IPPs, the Eagle River MOU, Colorado Springs Utilities plans with its Hoosier Pass collection system**.

   a. **Chuck Ogilby said while the West slope is discussing how to voluntarily curtail, new transmountain diversion plans are progressing**—these are **working against each other**. Jim agreed, but said **this is occurring in all 7 states**.

   b. We're looking to protect current water uses; that won't include future transmountain diverters.

   c. **Pokrandt made a plea for CBRT members to join the 2 technical committees** for the Colorado River Risk study: (1) the **quantitative "Geek squad**," including John Currier, Dave Kanzer, and Eric Kuhn of the Colorado River District. This committee will be meeting in early 2019. Phase 3 should be completed by the spring of 2019; they will then do what-if scenarios, and likely convene a West slope 4-basin roundtable meeting. One reason we're doing the risk study is **to ferret out differences between the basins**, particularly the Yampa-White and Gunnison basins. The **Yampa-White Basin has only post-1922 water rights**, and wants to develop more; meanwhile, the Gunnison basin believes any more development adds to the risk.

   d. (2) **Technical advisory committee**: Many CBRT members have joined this committee, and it too will be meeting early in 2019.

3. **Robinson Ditch Diversion Modification** presentation by Lisa McDonald of the Pitkin County Healthy Streams Board and Quinn Donnelly, P.E.

   a. The rock weir no longer raises the river level enough to divert water into the diversion ditch; this occurs from a riffle upstream. **The rock weir, also called a "grade control structure," presents a boat passage hazard** and causes the bank to be unstable. It is the **last obstacle on the Roaring Fork River** between Toothache Rapid and the Colorado River.

   b. This is the **first project of its type on the Roaring Fork River**.

   c. They would keep the boulder rock weir in place, and build a small weir upstream to ensure that water keeps pouring into Robinson Ditch.

d. **The total cost is $800,000** including funds to cover unexpected contingencies. Pitkin County is paying $110,000 and Eagle County is contributing $25,000. The project is asking the Colorado River District for $150,000, the Colorado Water Plan Grant Fund for $200,000, CBRT $45,000, and GOCO $150,000. Dave Kanzer said the $150,000 is not available because the Colorado River District is discontinuing its grant program, leaving unidentified funding of $270,000.

e. Stan Cazier asked how long it would be before they would start **construction**. It will likely be **delayed until 2020**. Pitkin County funded the entire Basalt whitewater park.

f. **Is the ditch company contributing to the cost of this project?** Bill Reynolds is the President of the Robinson Ditch Company. The ditch company supports the project, but it has **not committed any funding** for this project. They weren't the impetus for this project.

g. April asked how much the ditch company will be saving on ditch maintenance. Donnelly estimated it would **reduce maintenance by 50%**.

h. Carlyle asked **how many acres were irrigated**, and how many were agricultural. Quinn **did not know** the answer. (Ed—according to the CDSS Structure Summary Report, the ditch **diversion right is for 49 cfs, and it is irrigating 144 acres, 10 of which are sprinklered** and 134 of which are flood-irrigated. The **average annual diversion is 13,646 acre-feet**, an average of **95 acre feet per acre irrigated.** The rule of thumb in Colorado is that 1 cfs is enough to irrigate 40 acres, and that 2 acre-feet is needed to irrigate an acre of hay over an irrigation season. The acreage estimate is based on GIS mapping; the water commissioner reports that 552 acres are being irrigated.

i. **Why does it cost $800,000?** Erosion control and meeting CPW's requirements are expensive—they must build a coffer dam and monitor turbidity. Channel spanning work in a stream as large as the Roaring Fork River is expensive. The cost is based on the recent cost to build the Pitkin County whitewater part in Basalt. River work is expensive, and companies bid different amounts.

j. **Are recreational groups participating?** Yes, the Roaring Fork Fishing Guide Alliance supports it, as does Colorado Trout Unlimited. They cannot contribute financially to this project.

k. The Next Steps meeting will consider this January 22, and vote on this at the full CBRT meeting in January 2019.

4. **SWSI update, Russ Sands, CWCB**. The State Water Supply Initiative is a CWCB program started after the 2002 drought to quantify future water demands in Colorado. The update is expected to be completed by July 2019. In SWSI 2010, they estimated the M&I water gap in 2050. The 2020 version will do this on a node-by-node basis at 400+ river nodes in Colorado. The projections for the 5 scenarios were based on 8 factors

including **population growth, climate, agricultural demand, and consumer behavioral change**.

a. **The top 3 issues** they've are to (1) provide a tool kit that includes **messaging, infographics, and presentations**; (2) **telling the SWSI story** to provide the underlying data and help users understand the limits of the data; and (3) **unifying the brand** by rolling the SWSI update into Colorado's Water Plan.

b. The **basin roundtables want to spend WSRF money on BIP projects**, and integrate SWSI findings into their basin implementation plans (BIPs). They favor improved metrics, and money focused on implementing IPPs identified in the BIPs.

c. They are thinking of creating an implementation working group with representatives from each roundtable to join a monthly 90-minute call to determine how to fold the SWSI information into the BIP updates. This lets the roundtables talk to each other. They're also thinking of having a **basin-wide summit in September 2019 in Winter Park to implement the SWSI data** into the roundtable BIPs.

d. They want this to be a basin-driven process.

5. **Cloud seeding, Dave Kanzer, Colorado River District.** Maria Pastore, now with Colorado Springs Utilities, is in the audience; together with Greg Johnson of the Wilson Water, they authored the Wilson Water Group **compendium of all cloud seeding programs in Colorado, available on the CWCB and Colorado River District websites.**

a. **Cloud seeding is being targeted as a solution to the "drought",** which may be the new normal in Southwestern hydrology. This could also help the Colorado ski industry.

b. **Clouds are inherently inefficient, and a lot of precipitation passes overhead** without dropping. The snow can fall out up to 15-20 miles downwind from the cloud-based generator, which spray silver iodide that interacts with supercooled liquid water in the air in a range from -5 to -15 C. The silver iodide causes the snow to fall. They use aircraft in other areas, which proves to be more effective than ground-based systems. **Remote cloud seeding devices can be turned on and off from remote locations; they cost $35-50k each**, significantly more than non-remotely operated cloud seeding operations. One is in the Woody Creek Valley, another is in Eagle County near Redcliff.

c. **Vail has been doing this since 1976**, and the federal government has been doing it since the 1990s. There are 7 permitted areas in Colorado. Colorado has a multi-year agreement with the Lower Basin to help fund these devices. Currently, **$1m per year is being spent**, **with local water providers contributing 65%, the CWCB 18%, and Lower Basin states 17%.** In California's High Sierra there is a sophisticated network.

d. Since 1987, the Colorado DNR has delegated oversight responsibility to the CWCB; cloud-seeders must get a permit from them. Kanzer showed **a map with over 100 generators throughout Colorado**; green are ground-based, yellow are remote, and the **purple areas indicate where the most precipitation occurs in the state. The purple areas coincide with where ski areas are located**.

e. The NCRS has a study about cloud-seeding potential.

f. The target area is above 8,500' in the 4 headwater counties. **They would like the cloud seeding generators to be at higher elevations**. There are 25 ground-based and 4 remote cloud-seeding generators, and they operate from November through April. Grand County isn't very actively seeded, and could be appropriate for expansion. The Colorado River District would entertain grant requests for more cloud-seeding generators.

g. "System water" is water than nobody owns, such as new snow generated. **Some studies show it costs under $400 per acre foot to generate water** from cloud seeding. The roundtables are working with experts including the Desert Research Institute at the University of Northern Nevada.

h. The cloud seeding goal is to **operate for 2,000 hours per winter**; they cannot do that if there are no clouds. So far this year, they have been operating a lot.

i. Does it work? Kanzer reported that **some research shows 5-15% increase in snowfall**. It's very site specific and weather dependent, it has a lot of caveats, but it's one more tool in the tool box. The 2015 study, Climatology of Seeding Potential, shows the percentage of time when snow storms meet seeding threshold; in areas near Winter Park, the seeding threshold is met over 60% of the time that it is snowing.

j. **How do they know it works? They look for silver iodide in the snow pack.** It's inert, and not toxic to the environment. The moisture plumes are coming from the ocean; they aren't limited by the moisture, they're limited by the efficiency of the clouds. The literature shows there is **no environmental harm** from cloud seeding.

k. The state requires generators to **cease operating if SWE is 165% of normal in January, 155% of normal in February, and 145% of normal in March**.

l. The **Colorado River District is targeting Pitkin County** to investigate installing more cloud seeding devices. Aspen's integrated water management plan calls for more of these generators.

m. Steve Aquafresca says there needs to be more outreach about cloud seeding to get the public to support it.

n. Jeff Bandy, Denver Water, asked how many hours to date the generators have been seeding. They've been active so far in Winter Park, starting November 1, but the monthly reports won't be released until early December.

o. The City of Grand Junction is the operating entity for the Grand Mesa program.

p. Art Bowles asked if they try **to cloud-seed in the summer. Dave Kanzer said this will only work during the summer on the plains, not over the mountains**. Colorado state law prevents cloud-seeding from airplanes. Wyoming permits aerial cloud-seeding, and Colorado may be changing the law to permit Wyoming's planes to fly into Jackson County in northern Colorado.

q. They **compare regions with cloud-seeding with areas without, and try to determine if cloud-seeding works**.

r. Greg Poschman asked who pushed **for cloud seeding on Grand Mesa; the ski areas and Denver Water promoted it, not the Mesa County commissioners**. The Pitkin County commissioners will be addressing this, and have asked for funding and political support. If the Pitkin County Board of County Commissioners agree to go forward, the Colorado River District will work with them to install and operate the cloud-seeders.

6. Paul Bruchez gave an update on the funding plan. The Walton and Gates Foundations recommend polling the public to estimate if there is support for a funding initiative.